

Task 2. Supply potential for petroleum products in the USGC.

Prepared for:
California Energy Commission
By:
James Drew Laughlin
March, 2002

Agenda

J. Drew Laughlin

Assess USGC product supply potential for California and
Arizona gasoline and diesel fuel

- A. Refinery capacity assessment
- B. Import assessment
- C. Issues that could impact supply

A. Refinery capacity assessment

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- Estimate spare capacity
- Assess the ability of current refineries to supply product to the Tucson - Phoenix area via pipeline from the:
 - El Paso region and
 - USGC region
- Petrochemical competition

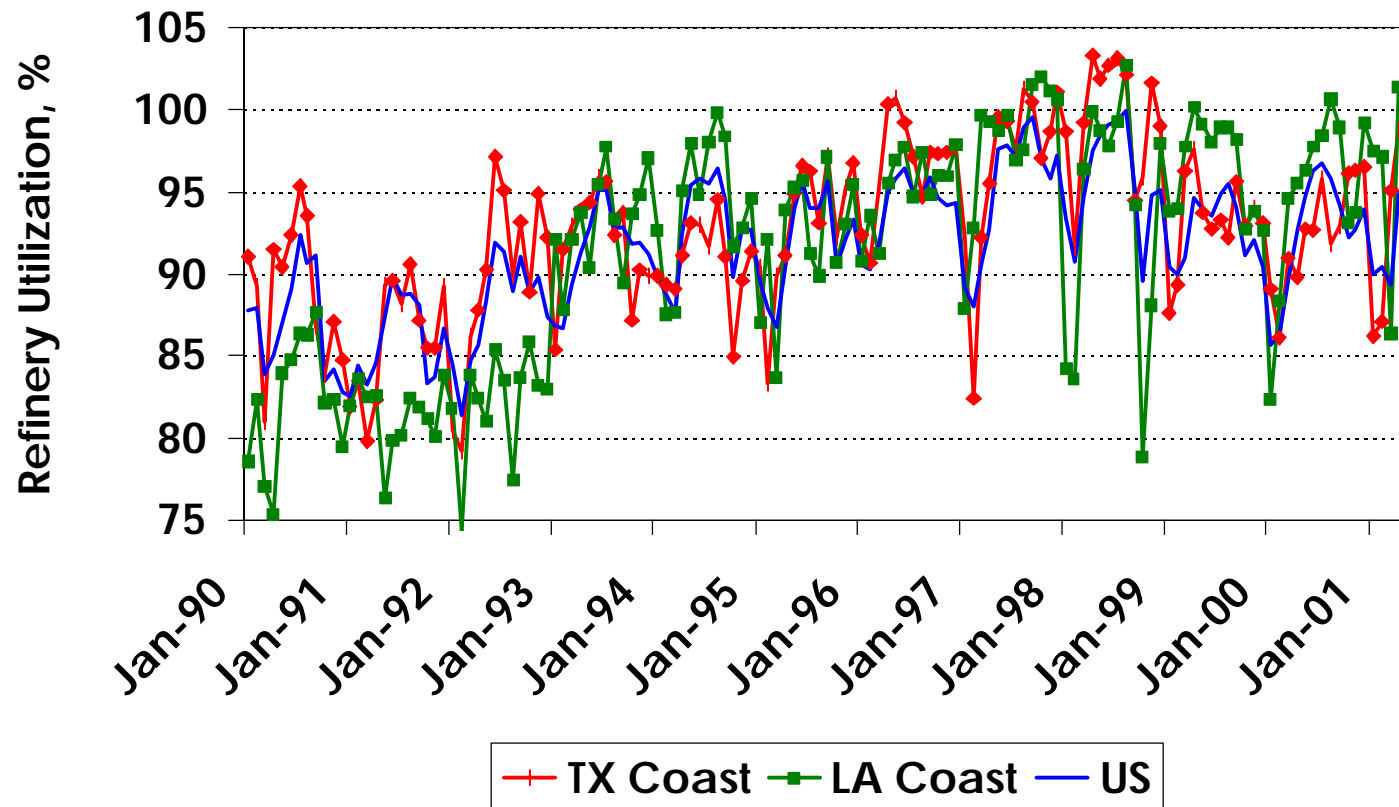
To Access Spare Capacity We Analyze DOE/EIA Capacity & Throughput Data

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- We found crude units full
- We found FCC units full
- We found hydrocracking units full
- We found coking units full
- We found the capacity to make alkylate (essential for CARB gasoline quality and blending off ethanol's RVP) lags FCC and coker expansions

US Gulf Coast Crude Units Full

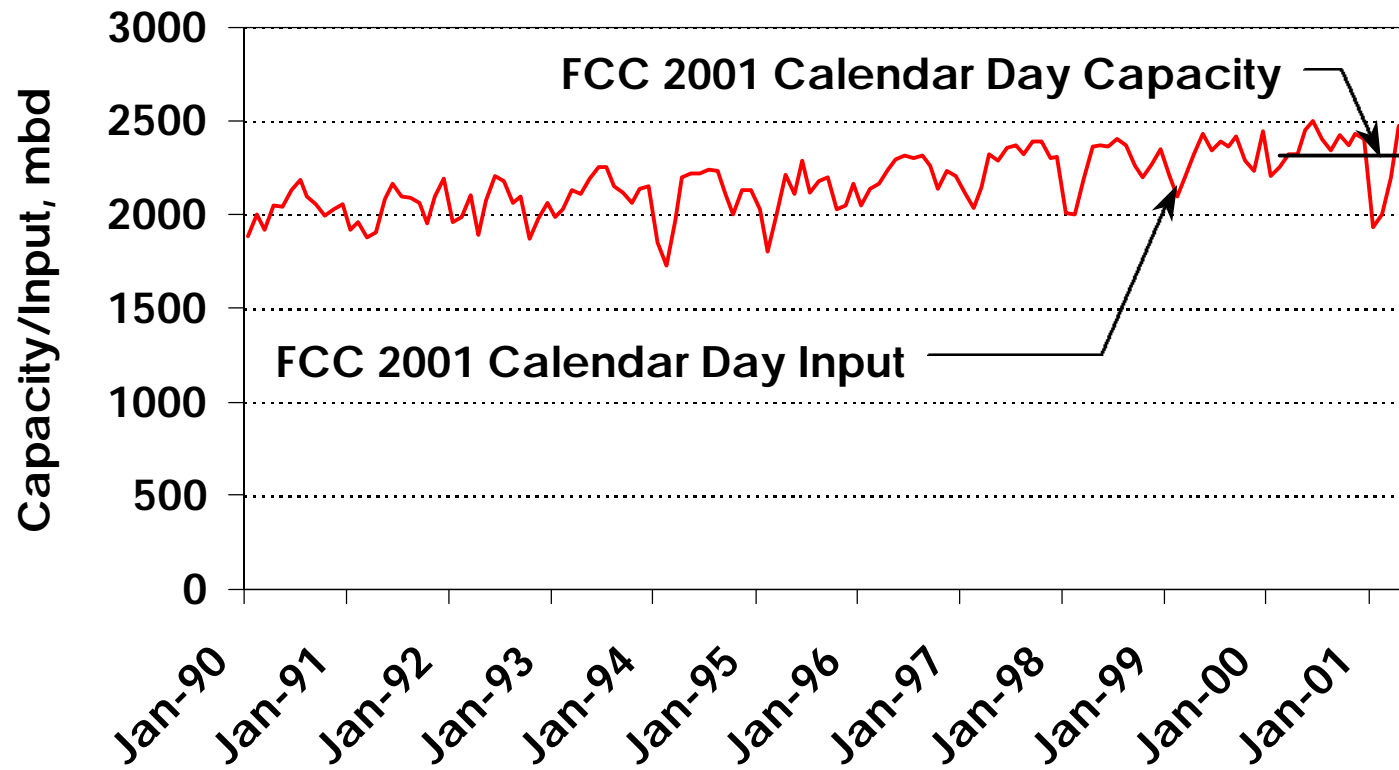
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US Gulf Coast FCC Units Full

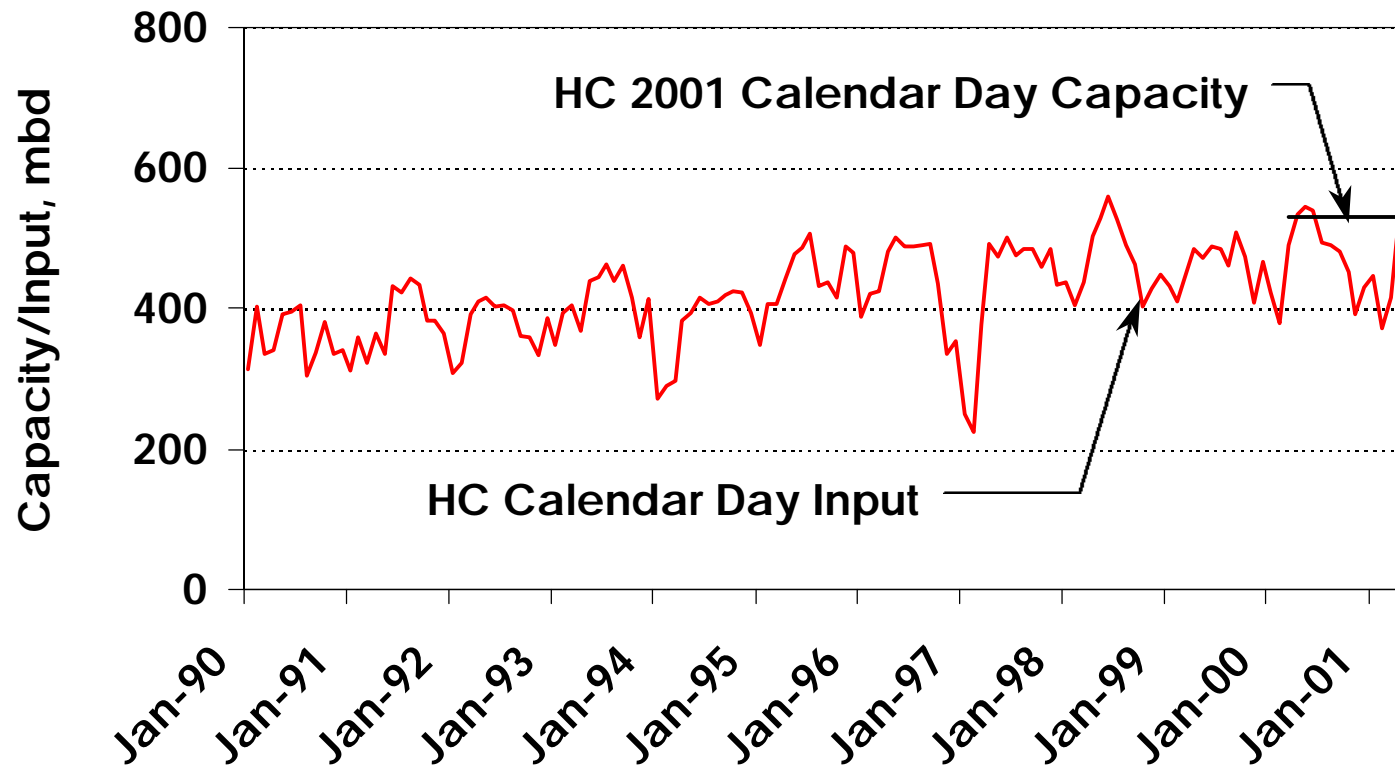
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US Gulf Coast Hydrocrackers Full

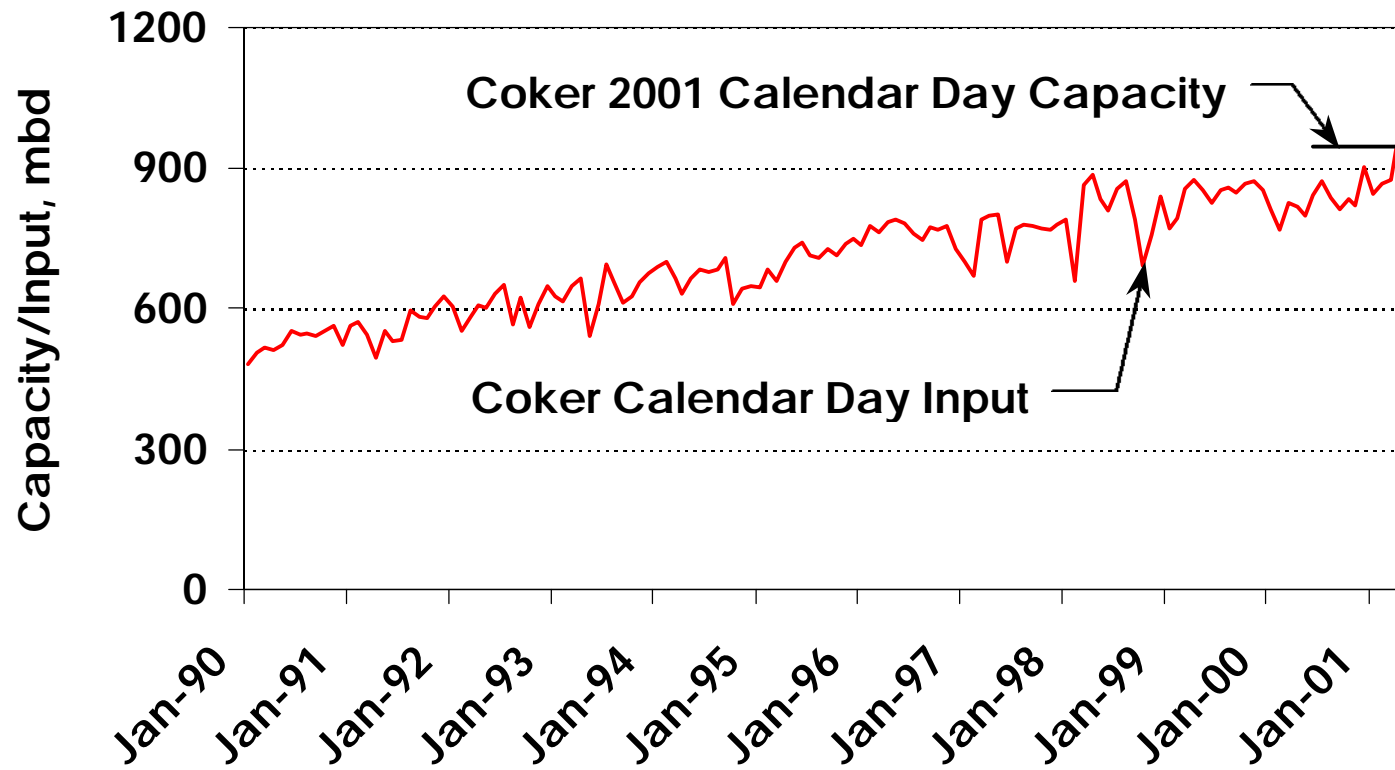
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US Gulf Coast Cokers Full

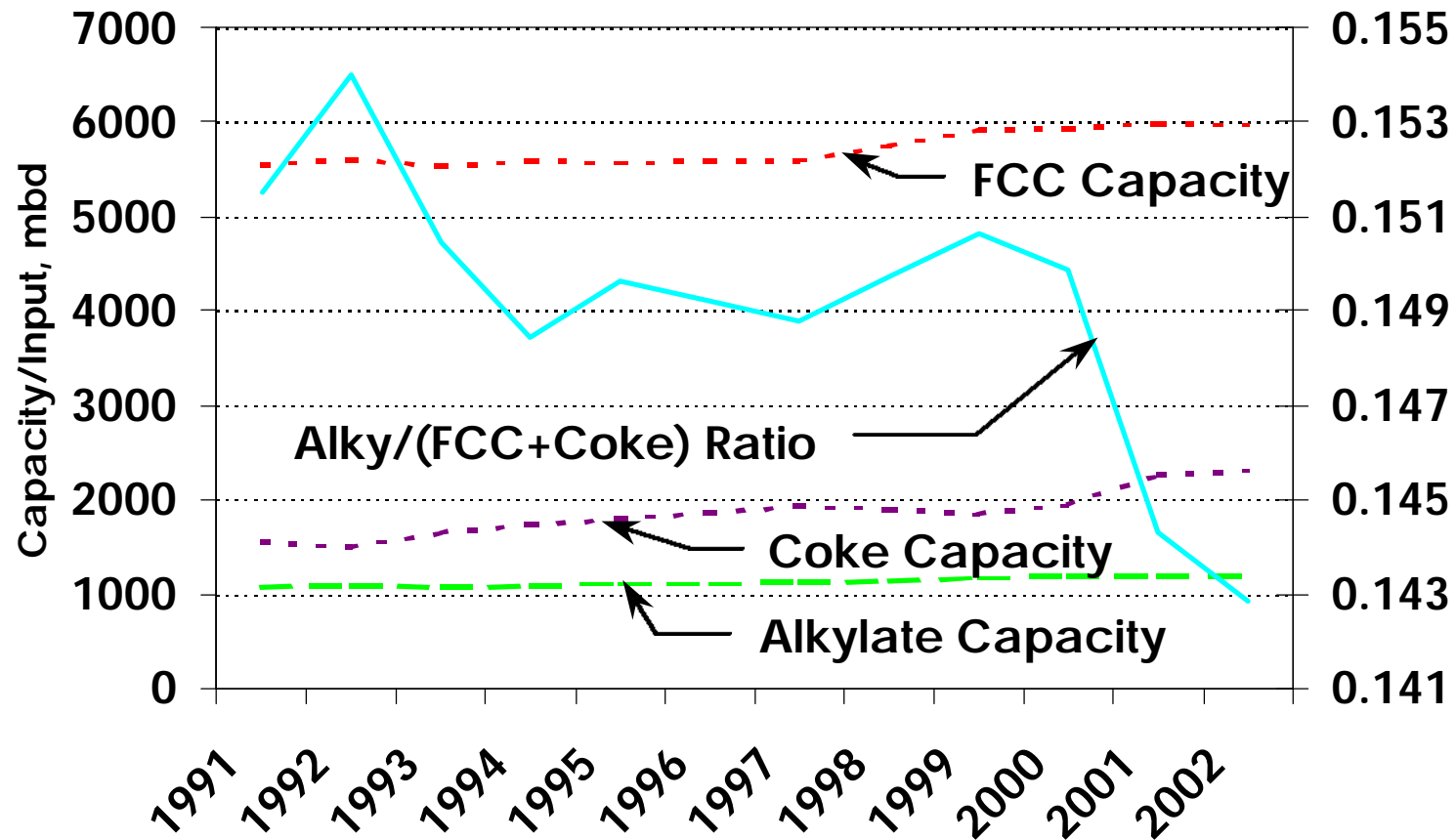
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Alkylation Capacity Lags FCC & Coker Expansions

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Source: DOE/EIA PSM

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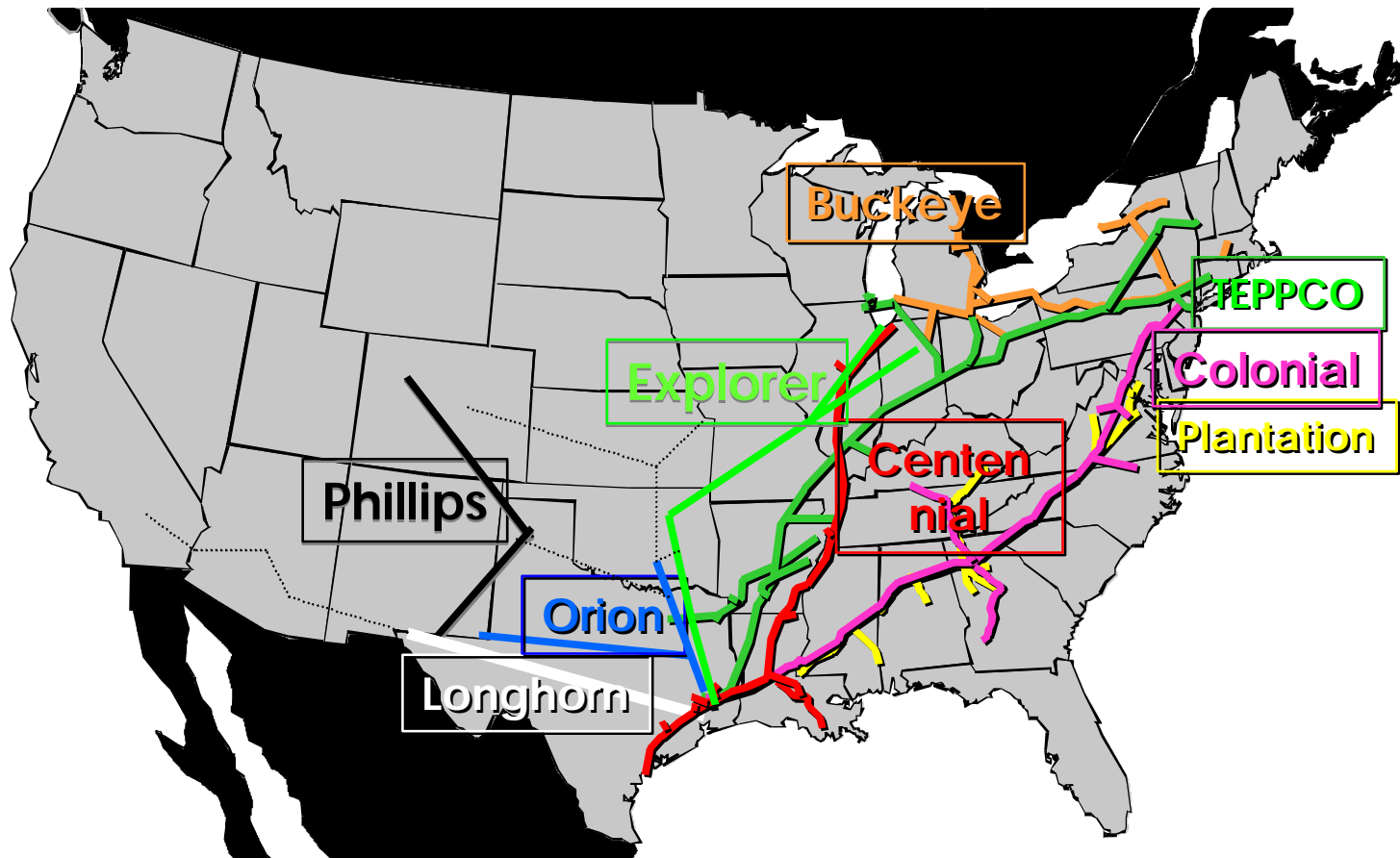
If Refineries Are Full, Now What?

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- They are full on a calendar day basis.
- Stream day capacity is about 10% more.
- When they all run that 10% creates supply side competition that lowers margins and expands marketing area.
- When some refineries shutdown, demand side competition increases margins and reduces marketing area.
- The following maps show how.

Refined Products Pipelines Allow USGC Market Area to Expand and Contract

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How It Works

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- High prices pull product. Low prices repel product.
- North Texas refiners can go:
 - South to El Paso and then west to AZ
 - Northwest to Denver, or
 - East to compete with USGC refiners
- USGC product economics impact El Paso by either pulling or repelling product from the North Texas refiners

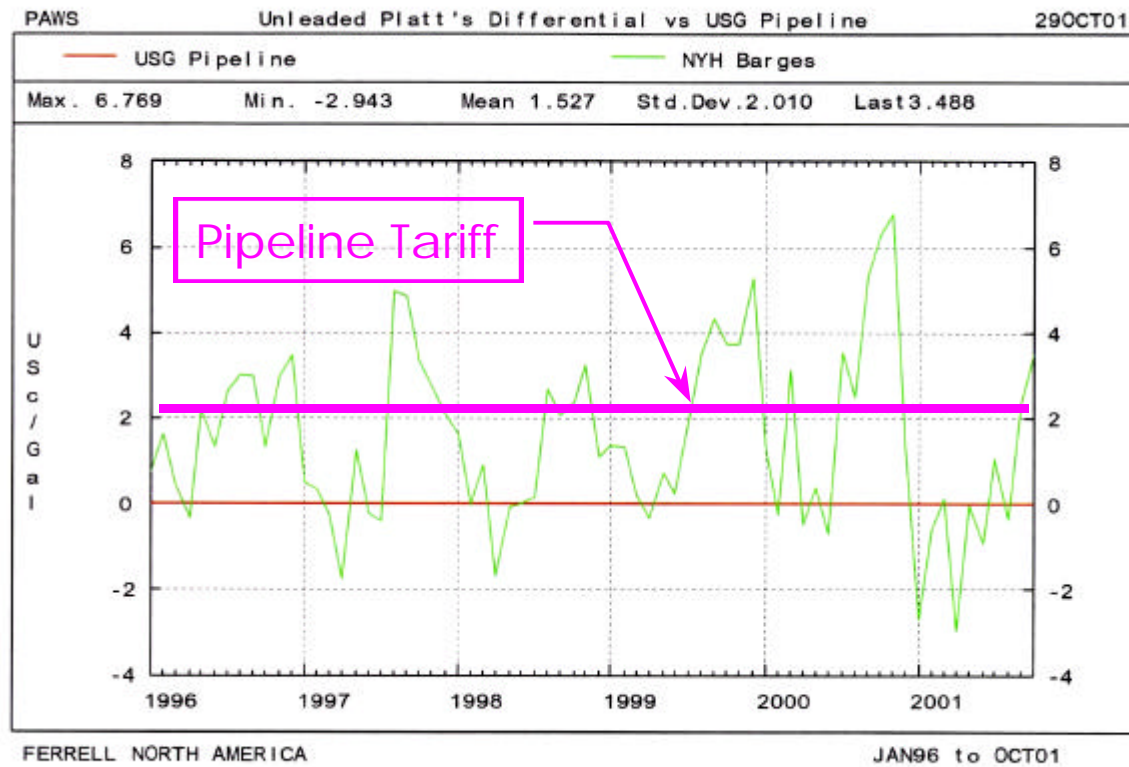
How It Works (Cont)

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- Midwest gasoline prices soared in the Spring of 2000.
- Local supply was short due to:
 - The winter summer RVP changeover &
 - No volume extension due to blending ethanol in summer grade Phase 2 RFG.
- When Explorer Pipeline broke, no price was high enough to pull product through a broken pipeline.
- The New England states are supplied by local refiners & imports and via pipeline and water from the USGC.
- Spot differentials below the pipeline tariff repel product while maximizing local refinery production.

NYH - USGC Differential Frequently Repels Pipeline Gasoline

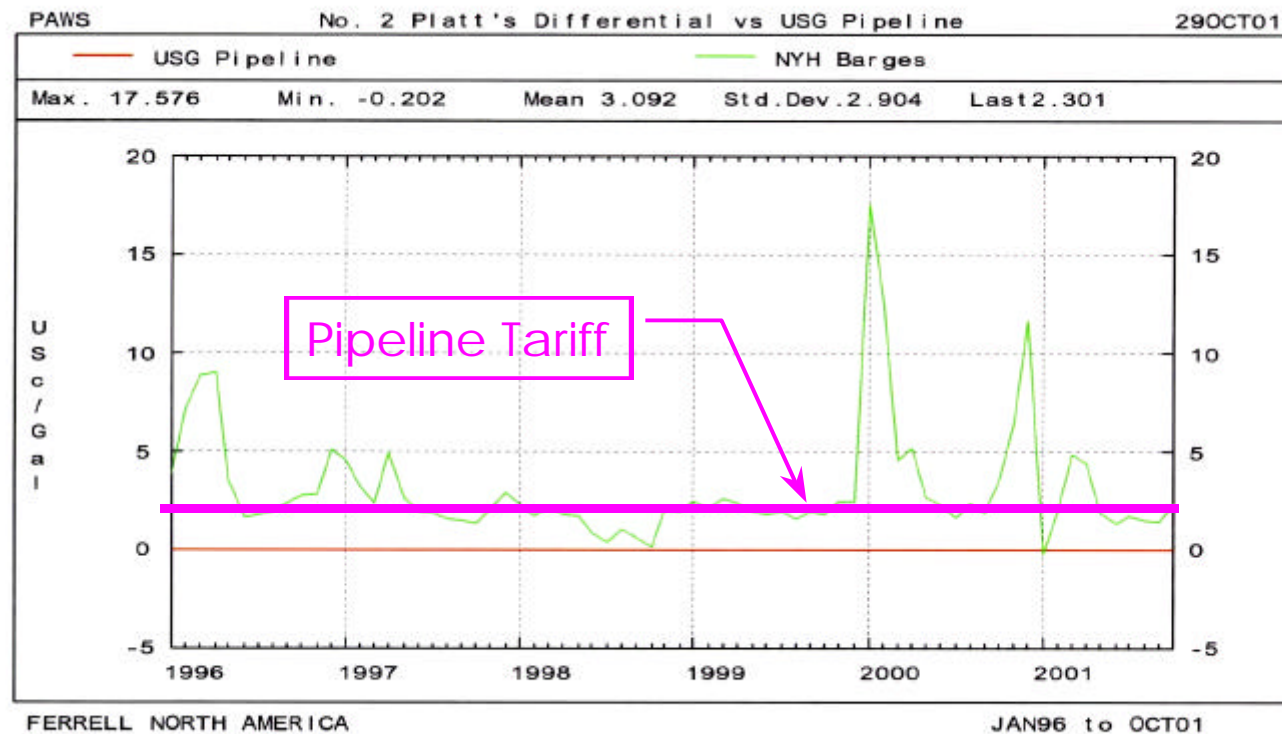
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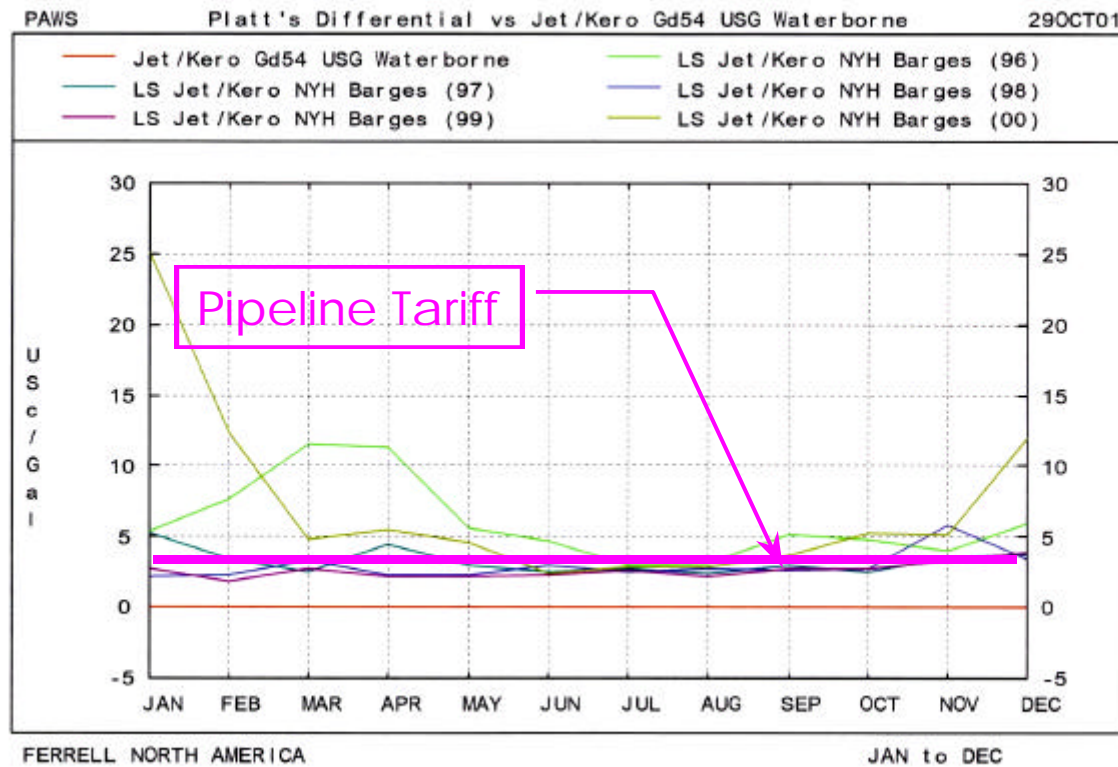
NYH - USGC Differential Seldom Repels Pipeline Distillate

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NYH - USGC Differential Seldom Repels Kero/Jet Via Pipeline

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How It Works (Cont.)

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- The New England states are supplied by local refiners & imports and via pipeline and water from the USGC.
- Spot differentials below the pipeline tariff repel product while maximizing local refinery production.
- More imports repel USGC product, lower USGC prices and push USGC products into other markets.

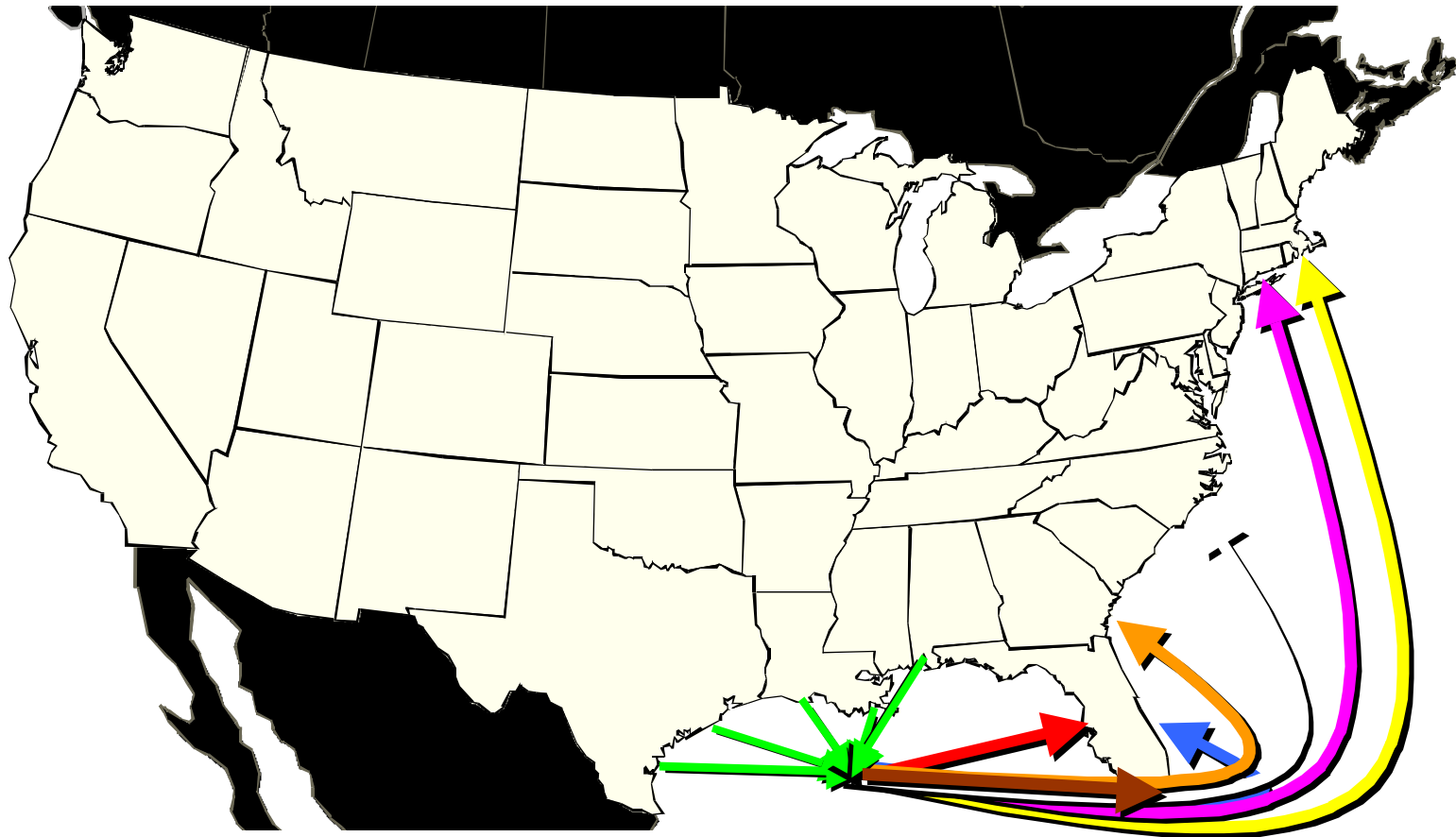
How It Works (Cont.)

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- Central Atlantic states have a similar situation to the New England states.
- The Lower Atlantic states have little motor fuel refining capacity and no pipelines. But, still:
- More imports repel USGC product, lower USGC prices and push USGC products into other markets.

Gulf Coast to Lower Atlantic (LAtl), Middle Atlantic (CAtl) and New England (NE) States

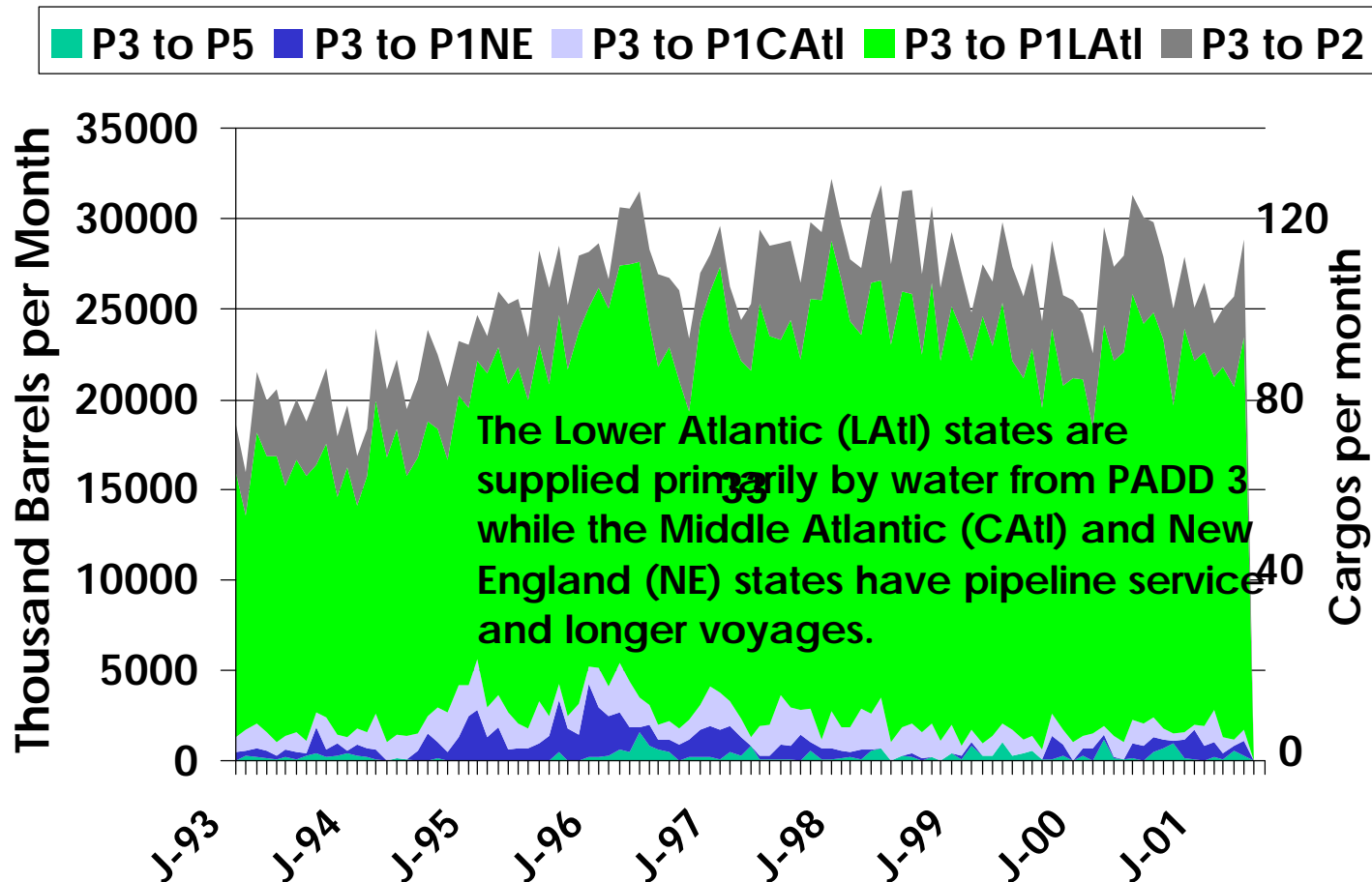
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Total PADD3 to Other US Via Water

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PETROCHEMICAL DEMAND

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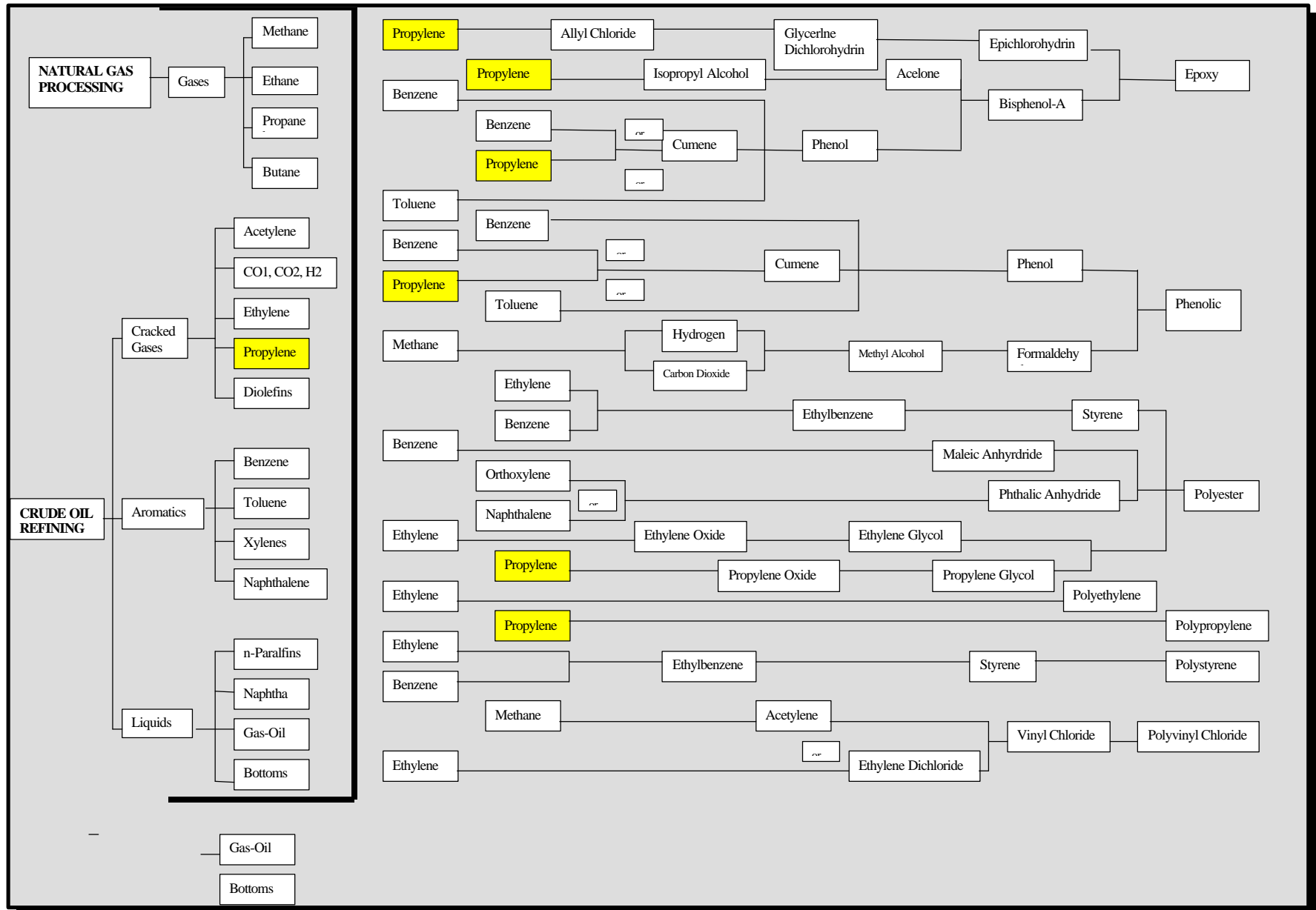
- Demand for petrochemical feedstock affects refiners supply
- Ethane, propane, butane, natural gasoline, naphtha, condensate and gas oil can be used as ethylene cracker feed or fuels.
- As demand for petrochemicals increases these products leave refinery feedstock and blending pools.
- As the value of ethylene cracker feedstock decreases these products return to fuels applications.

Petrochemical Competition

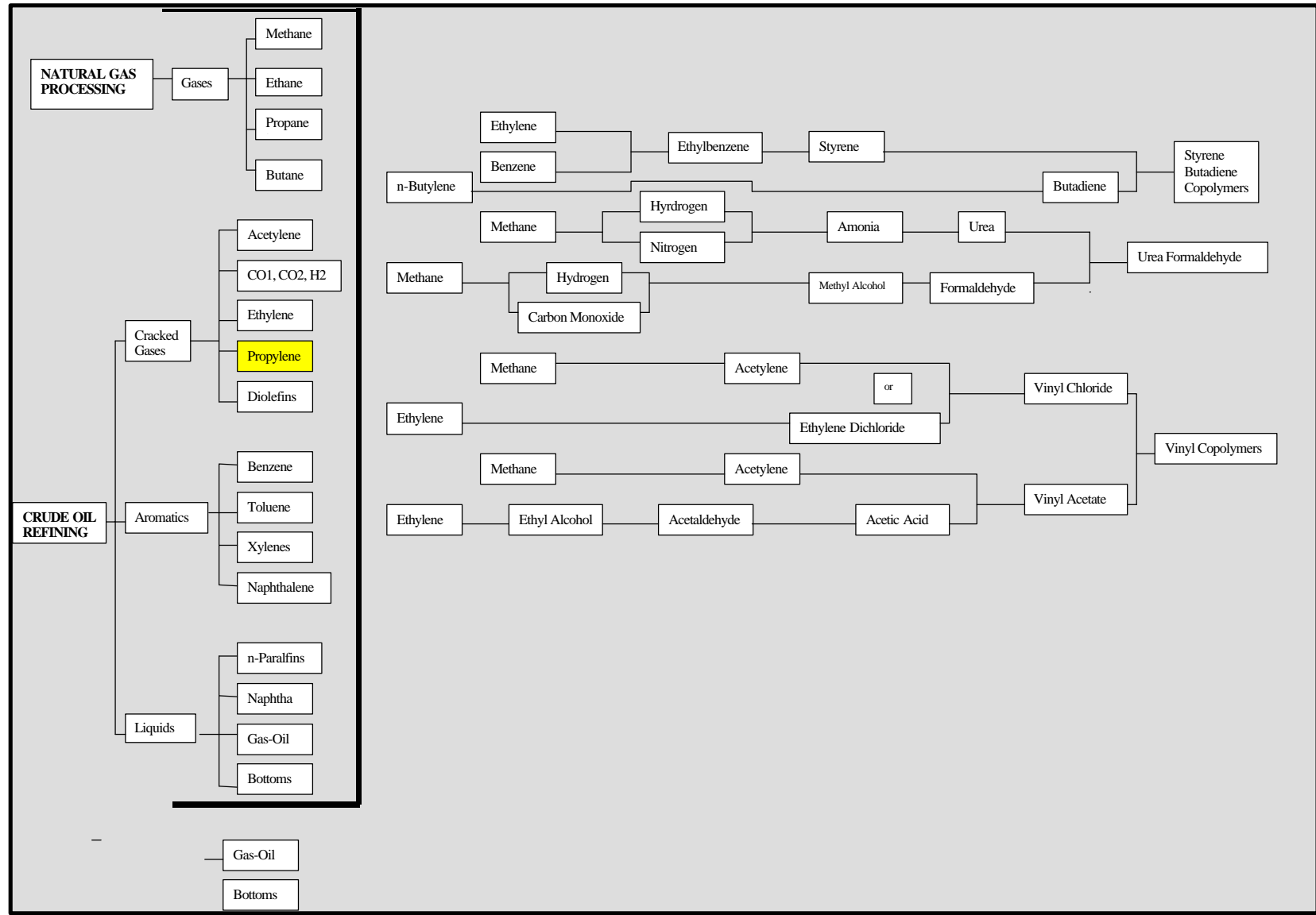
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- Petrochemicals usually win the feedstock competition over fuels.
- The following two slides shows the interaction between fuels (refiners) and petrochemicals.
- Note that propylene which is needed to make the C₇ alkylate that California needs has many petrochemical uses.

PLASTIC PRODUCTS DERIVED FROM PETROLEUM



PLASTIC PRODUCTS DERIVED FROM PETROLEUM (cont'd)



Propylene and Butylenes Are Used to Make the Alkylates, California Needs

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- Both olefins are used to make alkylates or isooctane that are essential for:
 - Blending off ethanol's RVP
 - Dilution of dirty burning components
- Refining is the swing source of C3= for petrochemical use
- Refining is the dumping ground for byproduct petrochemical C4=

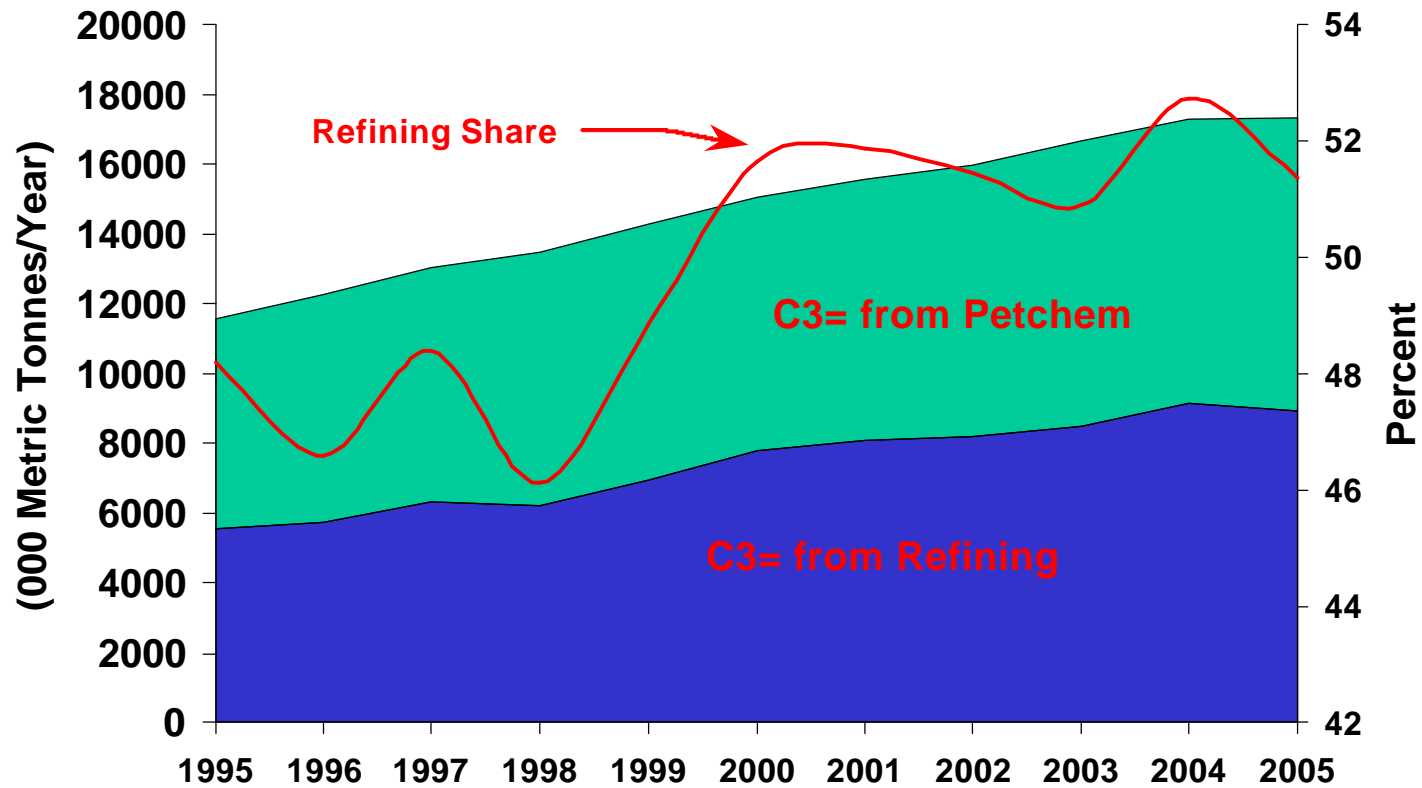
PROPYLENE DEMAND

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- Typically propylene is more valuable as a petrochemical than as gasoline.
- 1.0 Propylene ($C_3=$) & 1.6 isobutane (iC_4) react to make 1.8 alkylate.
- The value of alkylate in gasoline influences propylene value
- The price difference between iC_4 and gasoline dramatically effects the value of $C_3=$ to alkylation

Refining is Swing Propylene Source

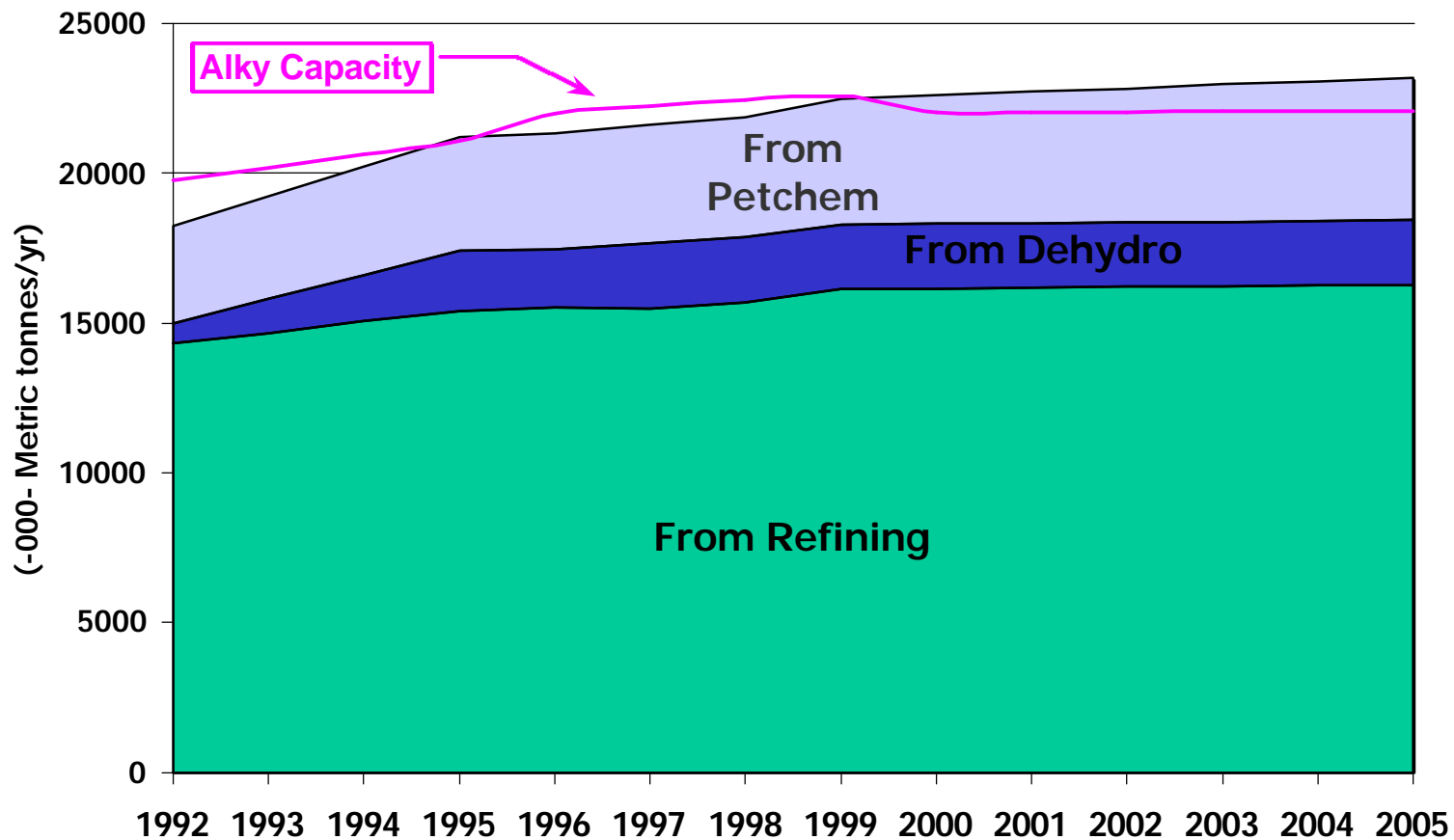
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U.S. Butylene Supply Comes Primarily from Refining

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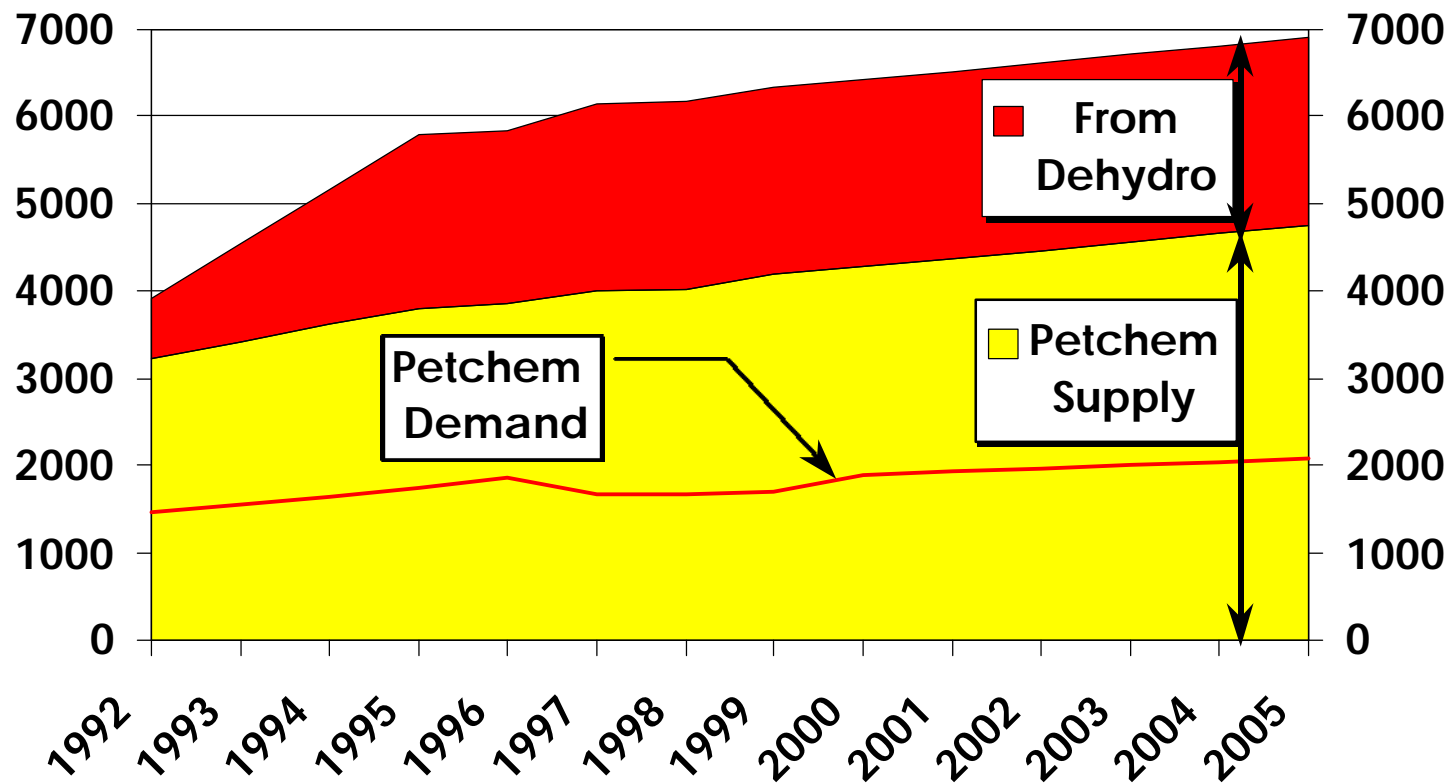


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Data source: CMAI 28

US Petrochemical Butylene Supply Exceeds Petrochemical Demand

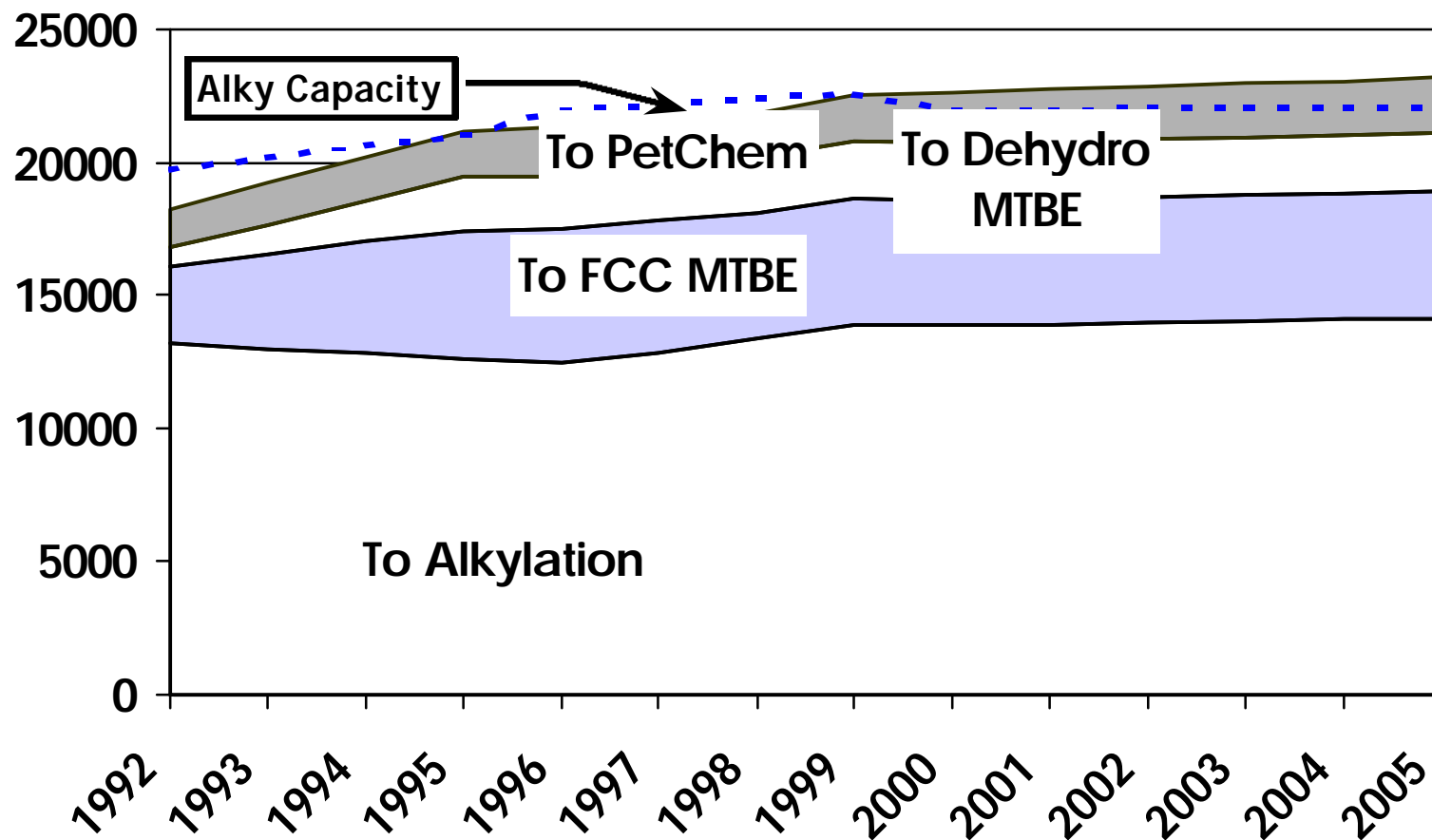
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U.S. Butylene Demand (-000- Metric tonnes/yr)

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Data source: CMAI Figure 5

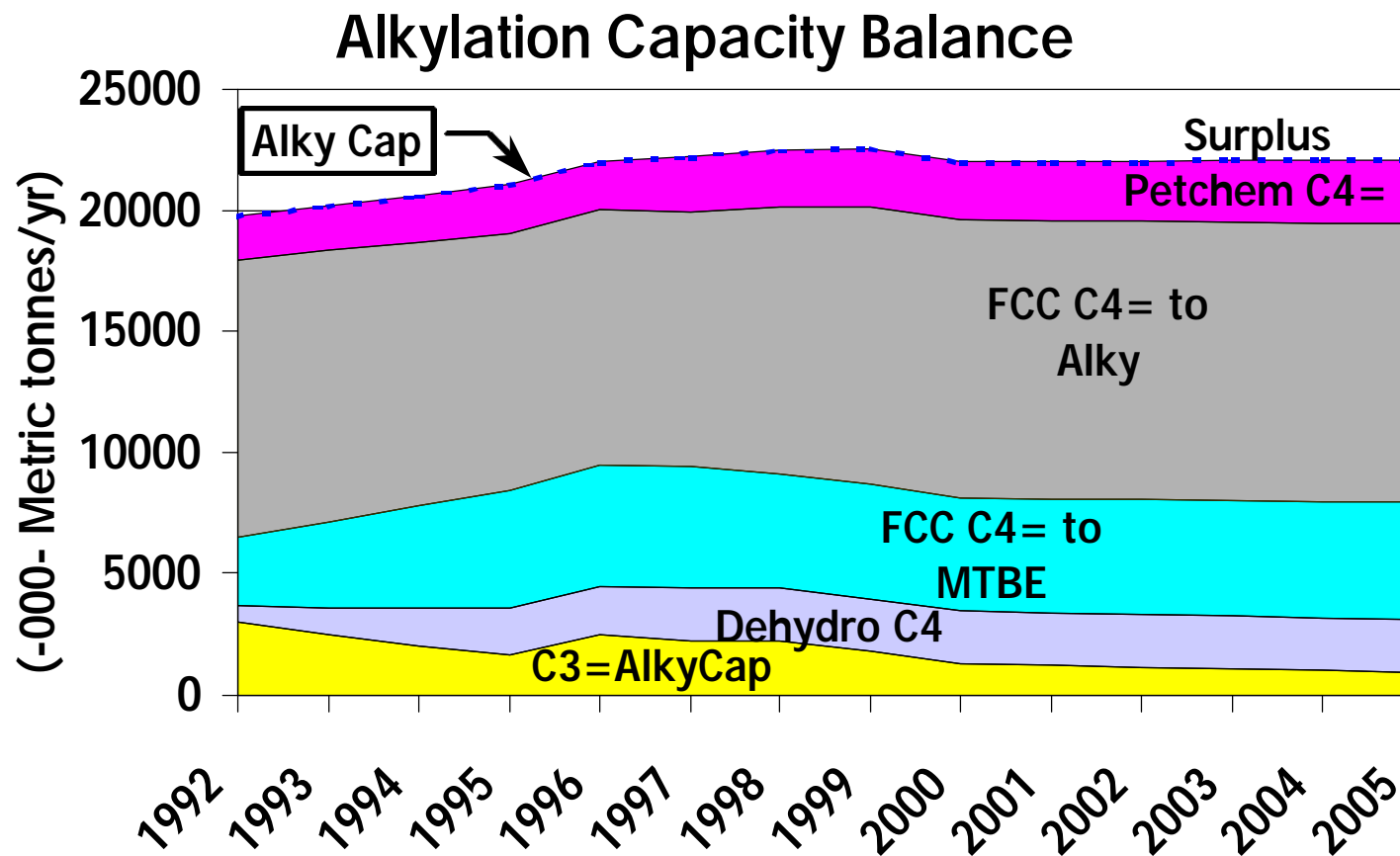
C3= and C4= Have to Go Somewhere

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- The economy sets Petchem demand
- Petchem producers can reduce production by shifting to lighter feeds
- Refiners can reduce charge rate or conversion
- Because Petchem uses for C3= are large and Petchem C4= uses are limited, refiners will discount C3= until they balance alkylation capacity

In a Growing Economy Alkylation Capacity Pushes C3= to Petchem

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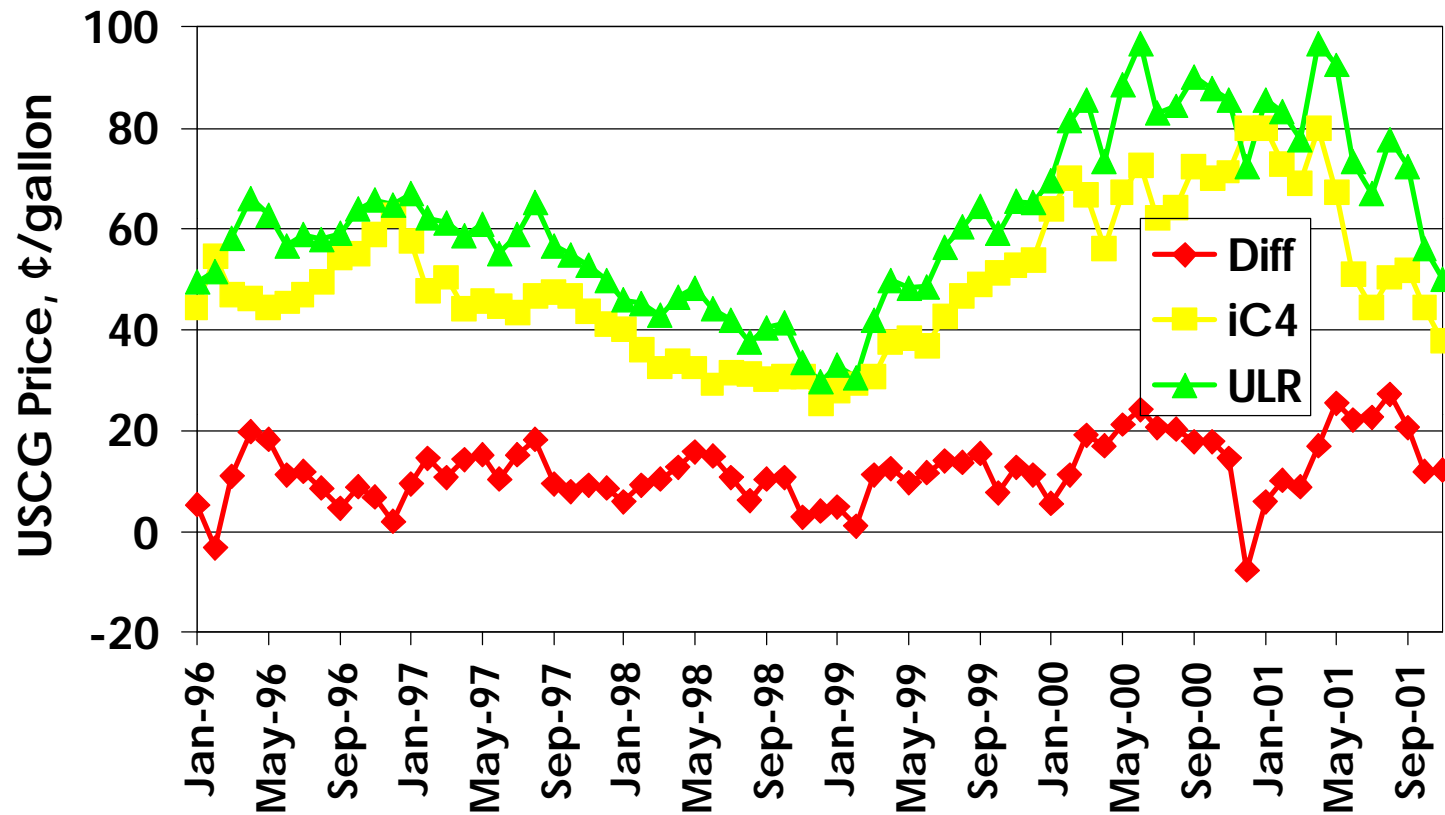


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Data source: CMA₃₂

Variability USGC ULR & iC4 Price Differences Inhibit Investments

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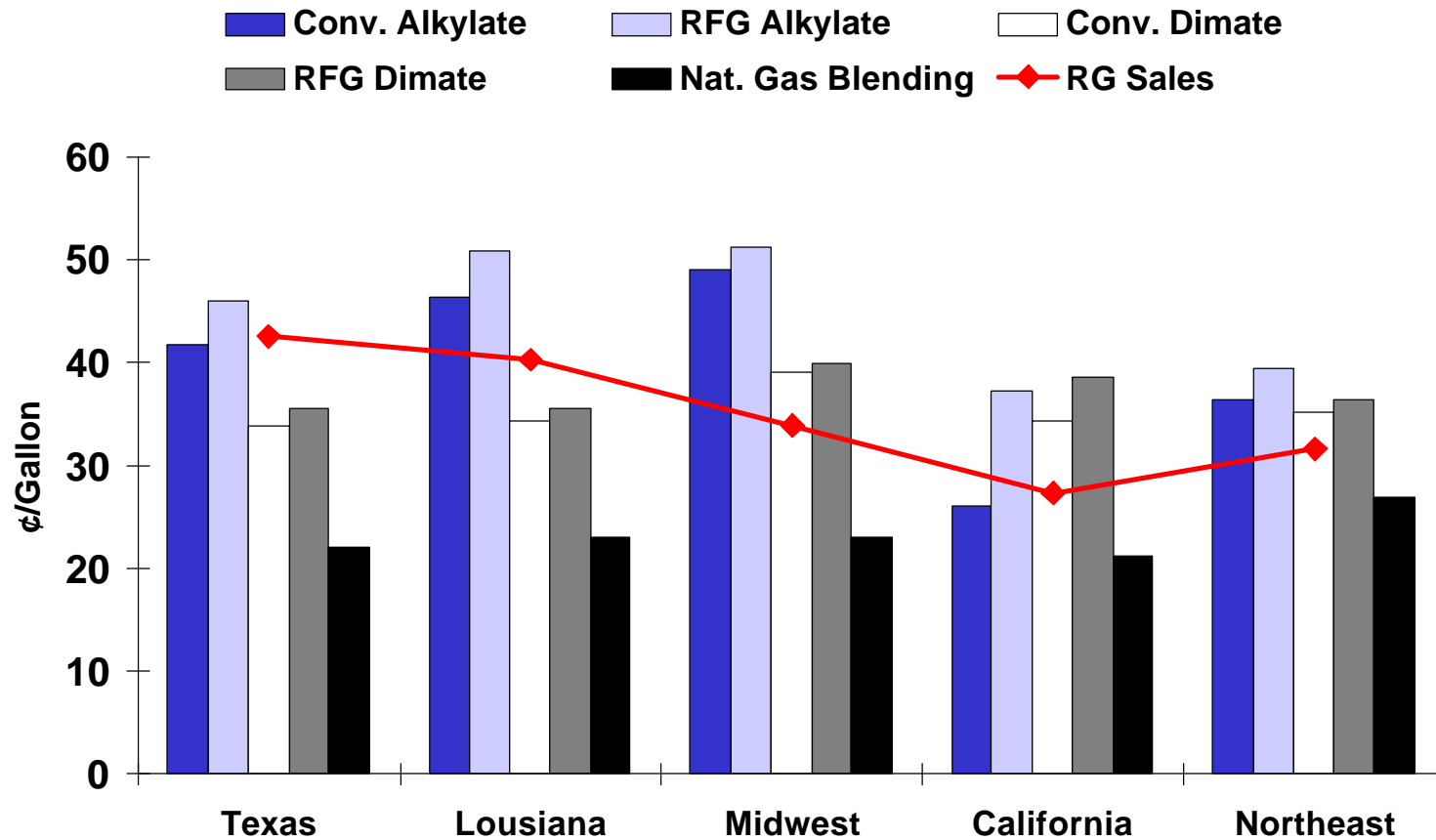


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Currently Regional Propylene Alternative Values Favor Refining

December 6, 2001

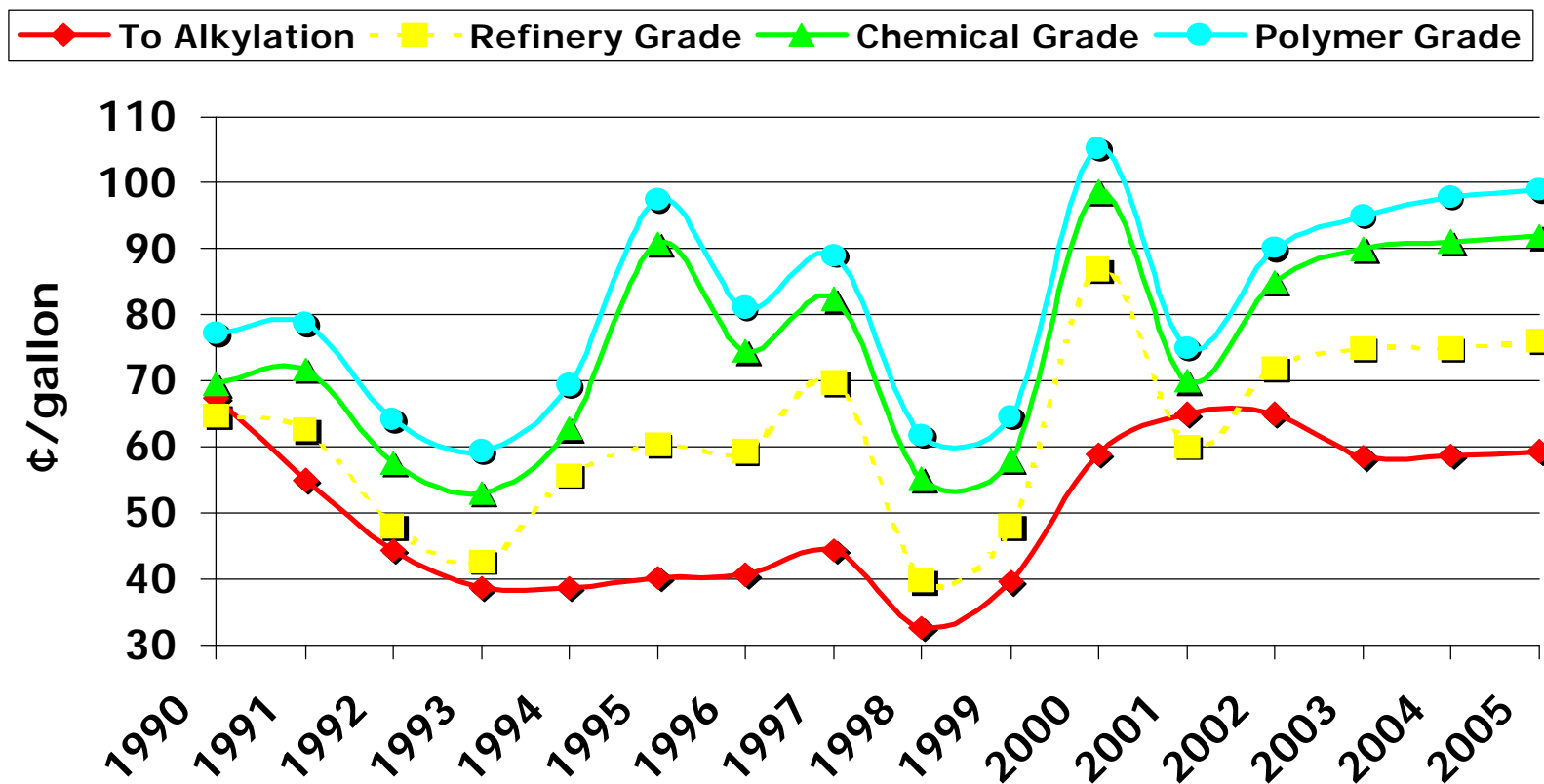
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But, Petrochemicals Usually Pull Propylene from Alkylation

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Recapping Refinery Capacity Assessment

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- Refineries full on calendar day basis but product available when all run
- Imports into PADD's 1 and/or 2 can free more product to move west
- Price competition determines if inland Texas refiners products flow east or west
- Petrochemical market now leaving product in fuels temporarily

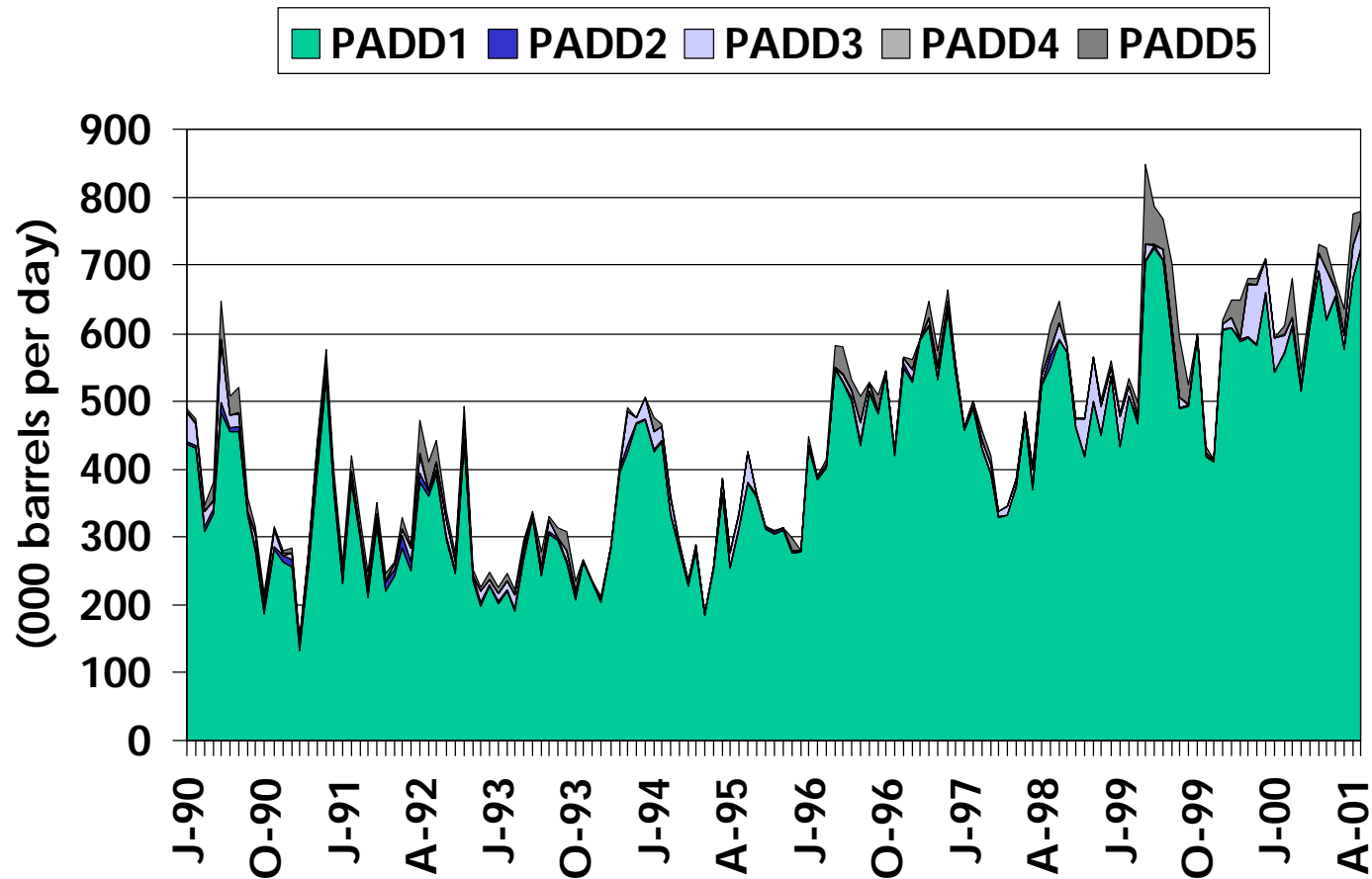
B. Import assessment

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- Historical imports
- Infrastructure to move imported products via Longhorn Pipeline
- Infrastructure to increase imports
- Modifications required:
 - What
 - How long?

Most Gasoline Imports Go to PADD 1

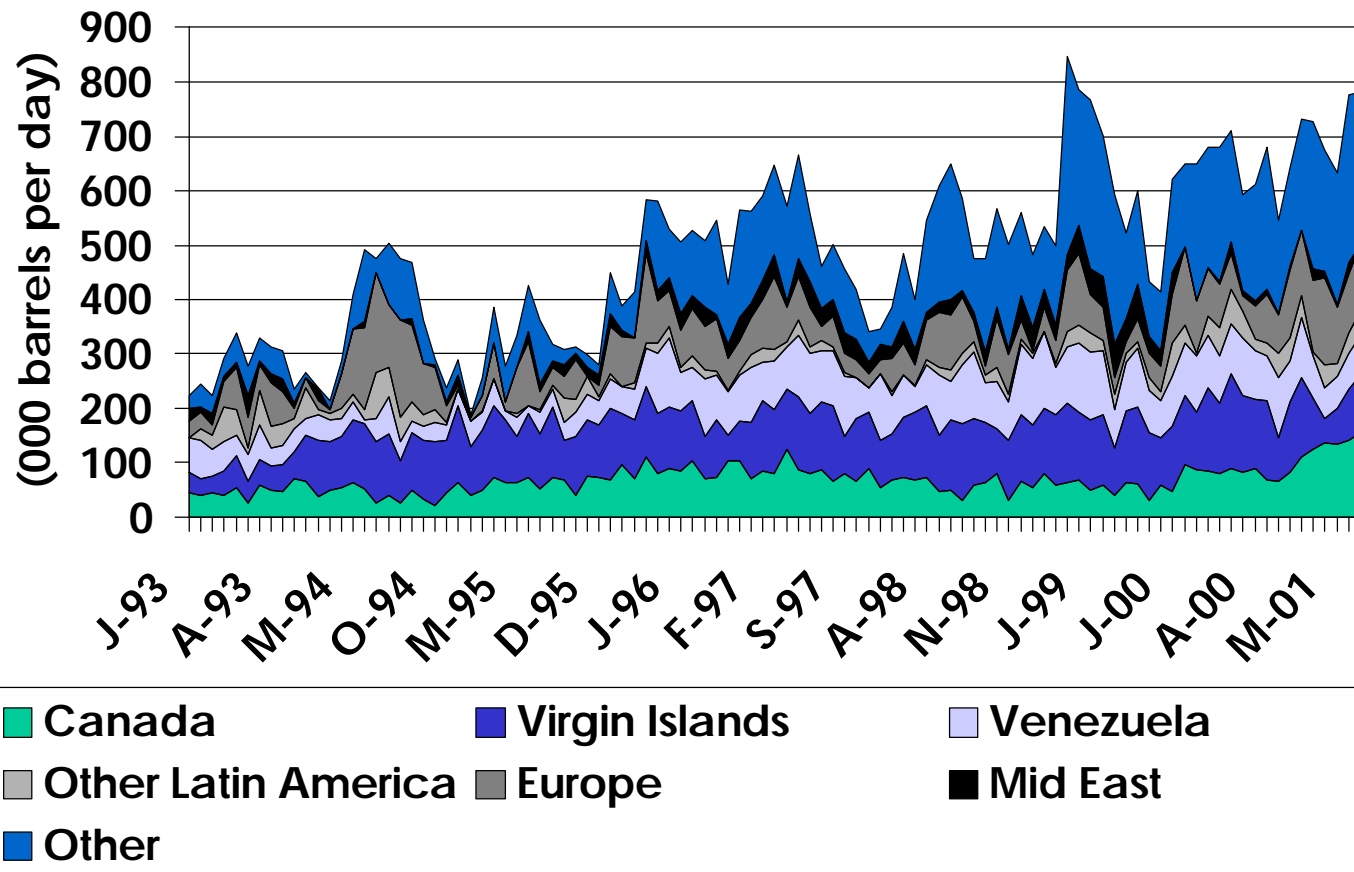
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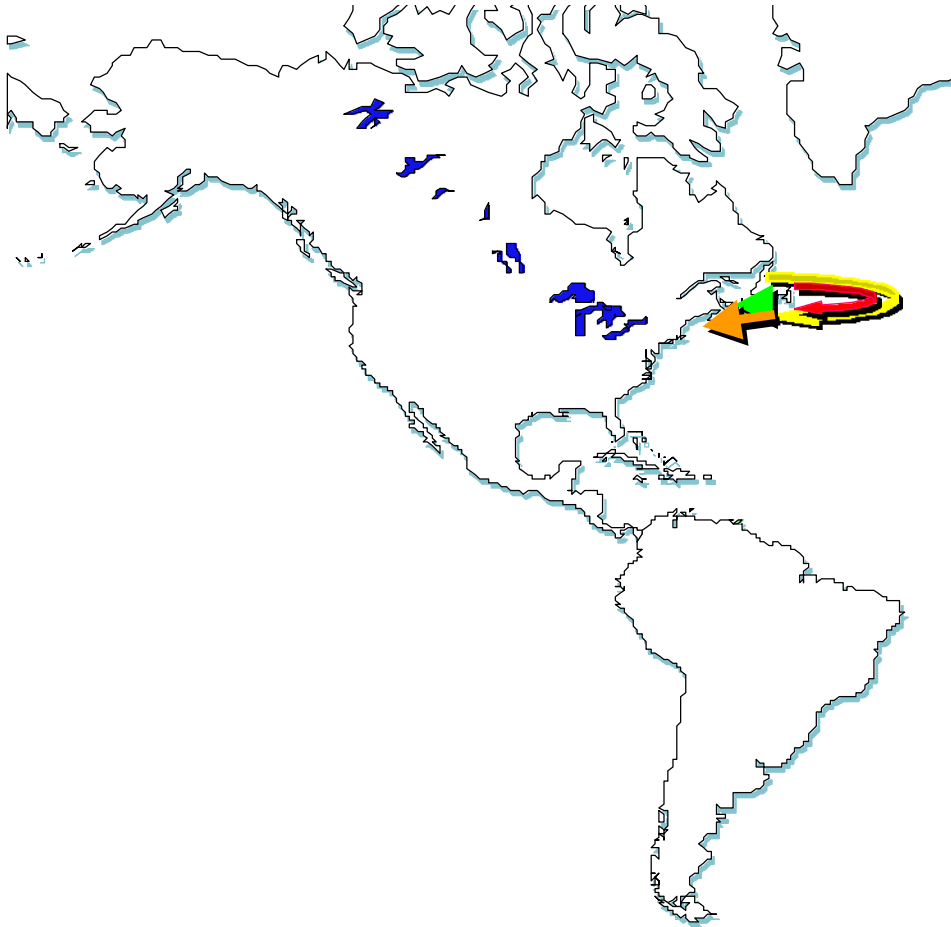
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Most PADD1 Gasoline Imports Come from the Western Hemisphere

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NEWFOUNDLAND &
NOVIA SCOTIA

TO

BOSTON

&

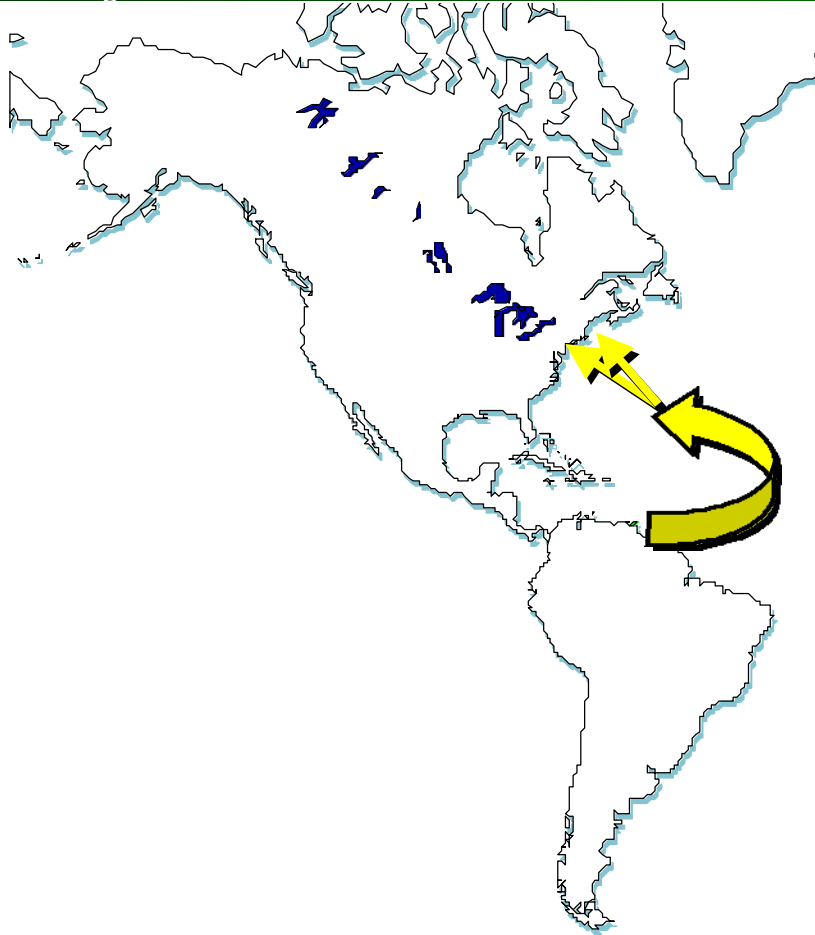
NEW YORK

Caribbean Gasoline

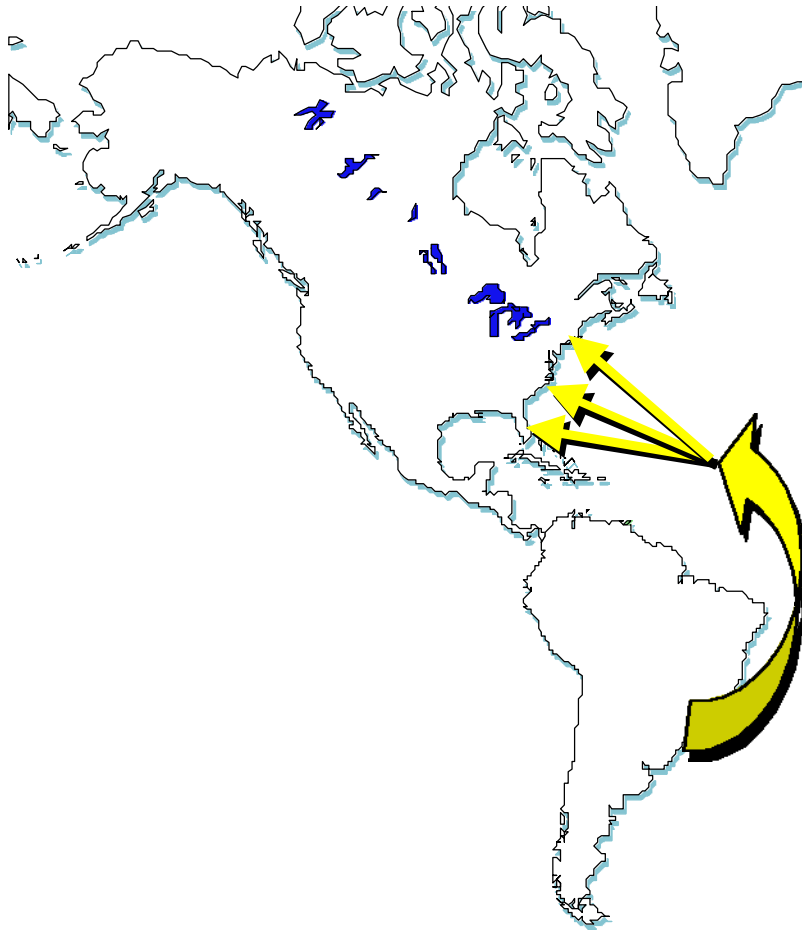
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VENEZUELA
TO
NEW YORK
&
BOSTON



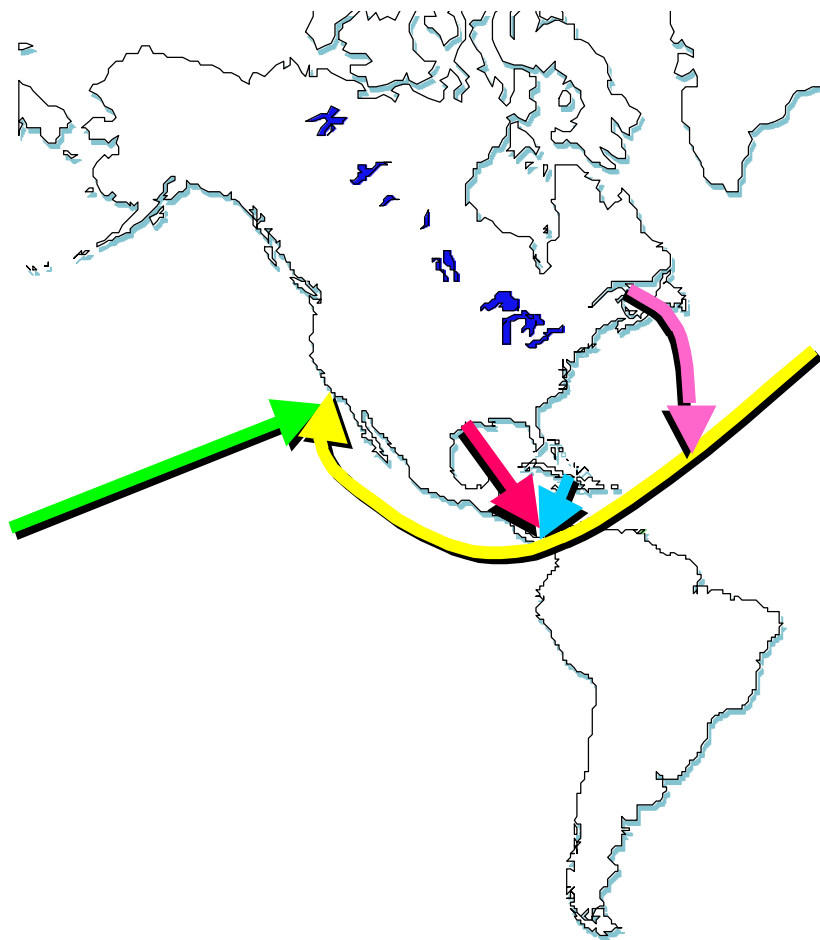
BRAZIL
TO
FLORIDA
SOUTHEAST USA
NEW YORK

Current Gasoline Distribution – Europe to US EC

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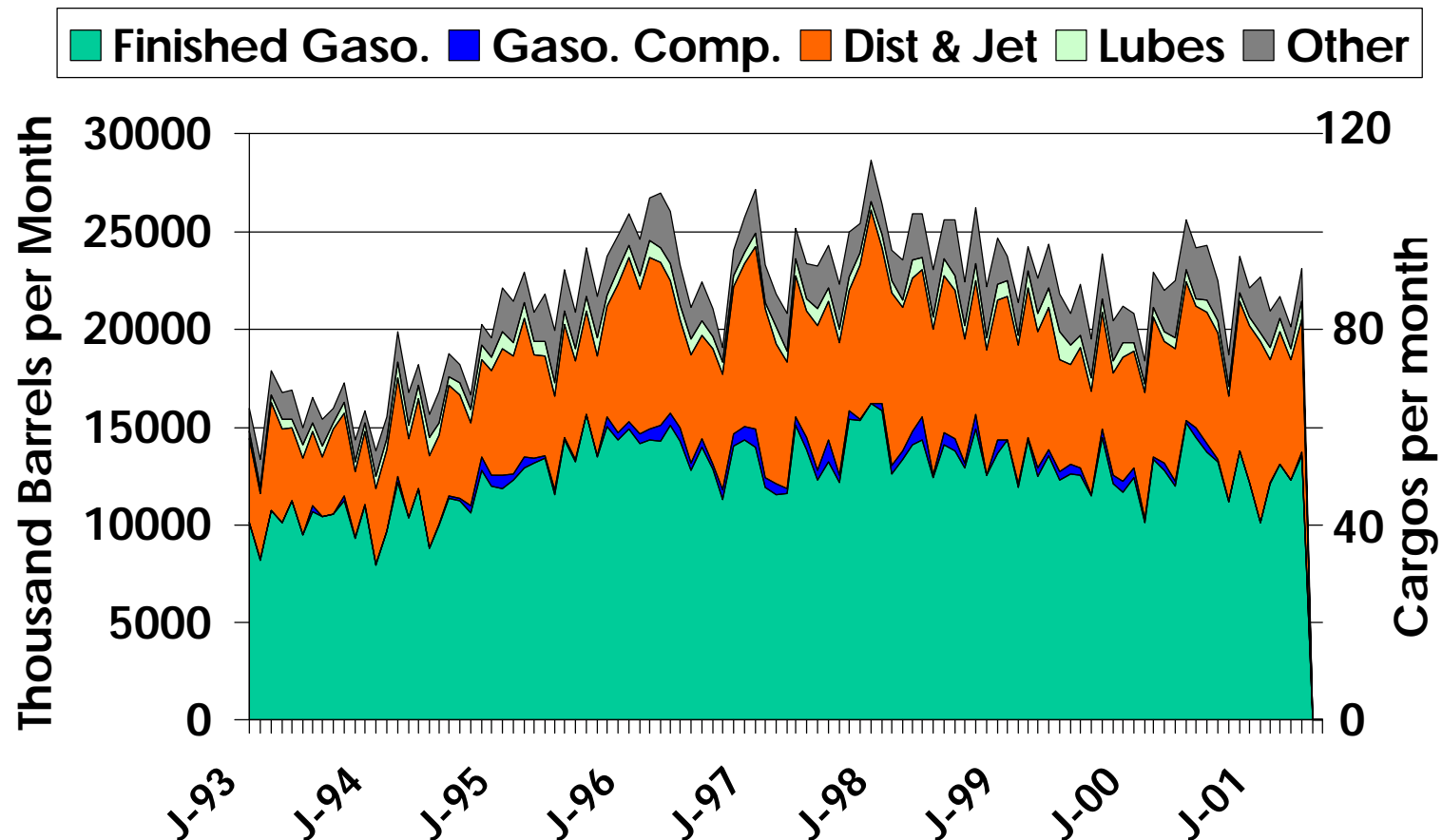
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CALIFORNIA
POST
MTBE BAN
SUPPLY

The Upward Import Trend is Consistent with to PADD 3 to PADD 1 Transfers20

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Increasing imports to PADD 1 has allowed USCG refiners to increase supply to the Midwest and the West. If quality product is available, this trend is expected to continue as US refineries are at capacity and Jones Act tankers are forced to retire. This trend probably will change as trade partners increase their demand for higher quality fuel products.

What Product Is Available

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- RFG Gasoline
- Conventional gasoline
- Limited blendstocks
- Limited California CARB Gasoline

Specification Changes In Arizona And Nevada Are The Key To Potential Supply

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- Gulf Coast Supplies of CARB TYPE gasoline and Blendstocks are Limited
- Changes in Arizona and Nevada specifications that make their gasoline closer to CARB specifications will force competition with California for limited supply
- California refiners may need the Arizona and Nevada markets to distribute lower quality gasoline in order to balance their refinery production

Refiner Capacity Reduction

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- The completion of the Longhorn Pipeline to El Paso may cause some refinery capacity to be lost in the region
- A portion of The Longhorn Pipeline's capacity would be used to replace existing supply instead of bringing additional product to the Southwest market

Arizona and New Mexico Demand May Utilize The Longhorn Pipeline Supply

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- Continued growth in the the Southwest may utilize the Longhorn capacity
- Growth rates of 3% to 5% will require most of Longhorns Capacity by 2010
- Southwest refinery closures and high product demand could use all of the Longhorn capacity

USGC refineries can supply product to the Tucson - Phoenix area via pipeline

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- Price competition between USGC and inland Texas refiners currently pushes product to or pulls product from the El Paso market.
- The Orion pipeline can move some product from USGC to West Texas.
- The Longhorn pipeline should start moving product in 2002. But
- The El Paso Tucson line is full.

Pipeline Infrastructure In Houston Ship Channel Area Can Do the Job

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- **Pipelines from Petrochemical Plants**
- **Pipelines from Corpus Christi refineries**
- **Pipeline from Beaumont**
- **Pipeline from Houston Refineries/Terminals**
- **Pipelines from Texas City Refineries**
- **Pipelines from Underground LPG Storage Facilities**
- **There are many ways to feed Longhorn**

Products Can Be Imported for Longhorn

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- East Coast imports are displacing product from East to North and West
- More for Longhorn is not a problem
- Direct Gulf Coast imports are also feasible via third party terminals like:
 - Kinder Morgan in Pasadena & Galena Park,
 - ITC Terminal,
 - Oil Tanking Terminal and
 - Beaumont Terminal

But We Need More Pipe

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- Initial Longhorn capacity: 75,000 bpd.
- Max. Longhorn capacity: 225,000 bpd.
- Probable regional refinery shutdowns and local demand growth can absorb most of this capacity
- Expansion of El Paso/Tucson pipeline is essential if Longhorn is to achieve maximum capacity by 2010.
- As Longhorn expands, local demand growth will still pull supply from California.

LONGHORN PIPELINE REQUIREMENTS

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- Longhorn may add to California supply by reducing the need to move product eastward from California
- Longhorn needs the support of:
 - California Government to guarantee its completion
 - Independent marketers
 - Blenders of both gasoline and diesel
 - Environmentalists

Longhorn Helps, BUT a Direct West Coast Pipeline Would Have These Advantages

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- Reduced delivery time to resolve problems
- The West Coast would be tied into the U.S. pipeline grid which would:
 - Allow arbitrage between regions
 - Create greater supply & price stability
 - Utilize the U.S. Gulf Coast refinery / chemical / LPG infrastructure
 - Reduce the West Coast price premium
 - Reduce potential tanker spills & California port bottlenecks

C. Issues that could impact supply

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- In this section I detail a number of issues that could affect USGC product supply availability and
- Assess each issue for its potential to:
 - Increase supply
 - Decrease supply

Potential USGC Supply Issues Include

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- Usual force majeure items such as: storms, fires and mechanical breakdowns
- Environmental regulatory changes such as: gasoline & diesel fuel desulfurization, Mobile Source Air Toxics
- Legislative changes such as: nationwide MTBE ban, removal of the oxygen standard, renewable fuels standard

Storms, Fires and Mechanical Breakdowns

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- This is why the refining industry has both stream day and calendar day capacities
- These supply disruptions tend to be temporary
- Short disruptions are hardly noticed
- Longer disruptions tend to cause price increases in order to attract alternate supplies

Gasoline & Diesel Fuel Desulfurization

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- Two refineries have announced shutdown due to the projected cost of compliance
- This and Longhorn may cause some regional capacity to shutdown
- Some gasoline octane and volume losses are expected.
- Some distillate may be diverted to cracker feed, but
- Generally when forced to make changes, refiners tweak capacity

Mobile Source Air Toxics

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- This regulation changed the baseline gasoline toxic emissions standards for refiners
- It reduces the flexibility of refiners to divert cleaner burning components like alkylate to the California market

Nationwide MTBE Ban

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- Removes significant volume of high octane gasoline from market
- Reduces volume of low octane components blended
- If oxygen standard stays in place, this will strain ethanol capacity
- Converting the C4='s to alkylate or isooctane helps but does not offset the quality-volume loss

Removal of the Oxygen Standard

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- Refiners would tend to use less oxygenates in RFG
- For MTBE blended gasoline this would reduce supply as many refiners would like to use less MTBE
- Not having to use ethanol in summer RFG increases gasoline supply as increased pentane blending more than offsets the ethanol rejection

Renewable Fuels Standard

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Assumed to replace oxygen standard

- New ethanol capacity would increase winter grade gasoline production
- Summer RFG production down if required per gallon, up if ethanol not used in RFG
- Summer conventional gasoline up by volume of ethanol added less butane rejected due to no RVP waiver

Conclusions

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- USGC refiners can increase supply to CA
 - By operating above calendar day rates
 - By letting imports displace product
- Imports are available and can help CA supply either by:
 - Direct shipment to California or
 - Displacement from the USGC
- More TX-CA pipeline capacity should help supply and lower CA fuel costs
- Quality of supply issues must still be addressed for CARB blendstocks